CLAIMS

We claim:

1. A testing system comprising:
   a. a handling system for automatically loading and positioning within a given tolerance each of a plurality of laser diode sub-assemblies;
   b. an optical system for automatically receiving each laser diode subassembly from the handling system and automatically performing one or more tests to measure functionality of each laser diode sub-assembly;
   c. a detection system for detecting characteristics associated with one or more tests performed by the optical system for each laser diode sub-assembly; and
   d. a control system for automatically receiving detected characteristics from the detection system, comparing the detected characteristics to stored expected characteristics for a properly functioning laser diode sub-assembly thereby forming a comparison, and providing control instructions to the optical system based on the comparison.

2. The testing system according to Claim 1 wherein the one or more tests are performed by automatically positioning a lens such that light generated from the laser diode sub-assembly is formed into laser light, and each test measures a desired characteristic of the laser light.

3. The testing system according to Claim 2 wherein the detection system includes one or more detection devices, each detection device corresponding to one of the one or more tests performed.

4. The testing system according to Claim 3 further comprising a mirror assembly properly positioned to direct the laser light to the one detection device corresponding to the test currently being performed by the optical system.

5. The testing system according to claim 4 wherein the detection device detects data associated with the desired characteristic and transmits the detected data to the control system.

6. The testing system according to claim 5 wherein the control system periodically sends control instructions to the optical system in response to the received detected data to incrementally adjust the position of the lens until an optimal lens position is obtained.

7. The testing system according to Claim 6 wherein the optical system further comprises one or more motors used to incrementally adjust the position of the lens.

8. The testing system according to Claim 1 wherein the handling system positions the laser diode sub-assembly at a specific location within a collet and maneuvers the collet with the positioned laser diode sub-assembly to a specific location within the optical system.

9. The testing system according to Claim 1 wherein the control system stores the detected characteristics and associates the detected characteristics to the laser diode sub-assembly from which the detected characteristics are generated.

10. The testing system according to Claim 1 wherein the handling system comprises a loading device for automatically loading and unloading each of the laser diode sub-assemblies into and out of one of one or more collets, a carousel including one or more nests, each nest for supporting one of the one or more collets, wherein the carousel moves

each collet from a loading position, to one or more testing positions, and to an unloading position.

11. The testing system according to Claim 10 wherein each collet supported by the carousel is thermally conditioned by a thermo-electronic controller to within a first thermal tolerance.

12. The testing system according to Claim 11 wherein the optical system automatically secures the collet into a specified position by actuating a thermal conditioning apparatus against a bottom surface of the collet.

13. The testing system according to Claim 11 wherein the collet, once moved to one of one or more testing positions, is automatically removed from the carousel and loaded into the optical system by the handling system.

14. The testing system according to Claim 13 further comprising a thermal conditioning apparatus within the optical system for thermally conditioning the collet to within a second thermal tolerance and to dynamically thermally condition the collet as power is applied to the laser diode sub-assembly within the collet during one of the one or more tests performed in order to maintain the thermal conditioning of the collet within the second thermal tolerance.

15. The testing system according to Claim 10 wherein each laser diode sub-assembly to be loaded into one of the one or more collets is carried over a camera by the loading device prior to loading the laser diode sub-assembly into the collet wherein the camera scans an identification marking on the laser diode sub-assembly for tracking the laser diode sub-assembly within the testing system and to associate the detected characteristics of each

test performed on the laser diode sub-assembly to the identification marking of the laser diode sub-assembly.

16. The testing system according to Claim 15 wherein each laser diode sub-assembly to be unloaded from handling system is carried over a camera by the loading device subsequent to removing the laser diode sub-assembly from the collet wherein the camera scans the identification marking on the laser diode sub-assembly for identifying the laser diode sub-assembly and confirming that the laser diode sub-assembly is unloaded from the handling system.

17. The testing system according to Claim 10 wherein the carousel incrementally rotates through a plurality of positions, wherein the loading position and the one or more testing positions are included within the plurality of positions, further wherein the handling system uses sensors to monitor that the carousel accurately increments from one position to the next.

18. The testing system according to Claim 17 wherein the sensors also monitor that the laser diode sub-assembly is positioned within the collet within the given tolerance.

19. An automatically aligning optical testing system comprising:

a. means for securing a laser diode sub-assembly into a fixed position;

b. a lens for lasing a light output from the laser diode sub-assembly;

c. a vertical means for clamping the lens into a fixed vertical position;

d. a rotational means for clamping the lens into a fixed rotational position;

e. means for applying power to the laser diode sub-assembly;

f. a mirror assembly for directing the laser light to a detection device;

g. a first motor coupled to the vertical means for clamping for moving the vertical means for clamping in a vertical direction, thereby vertically moving the lens;

h. a second motor coupled to the rotational means for clamping for rotating the rotational means for clamping, thereby rotating the lens; and

i. a receiving circuit coupled to the first motor and to the second motor for receiving control instructions from a control system, wherein the control system determines the control instructions by analyzing the laser light detected by the detection device,

wherein the control instructions instruct the first and second motors to incrementally step thereby adjusting the position of the lens relative the fixed position of the laser diode sub-assembly, further wherein the receiving circuit iteratively receives control instructions to adjust the position of the lens until an optimal lens position is reached at which time testing of the laser diode sub-assembly is performed.

20. The automatically aligning optical testing system of Claim 19 wherein the first and the second motors are picomotors.

21. The automatically aligning optical testing system of Claim 19 wherein the means for securing the laser diode sub-assembly into the fixed position includes positioning the laser diode sub-assembly into a collet and actuating a thermal conditioning apparatus against a bottom surface of the collet.

22. The automatically aligning optical testing system of Claim 21 wherein the thermal conditioning apparatus thermally conditions the collet to within a thermal tolerance and dynamically thermally conditions the collet as power is applied to the laser diode sub-assembly in order to maintain the thermal conditioning of the collet within the thermal tolerance.

23. The automatically aligning optical testing system of Claim 19 further comprising an air cylinder coupled to the mirror assembly for rotating a mirror within the mirror assembly thereby directing the laser light to one of one or more detection devices.

24. A method of automatically performing optical tests on a device comprising:

a. automatically loading a laser diode sub-assembly within a holding device;

b. automatically positioning the holding device within a lens assembly;

c. automatically detecting desired characteristics of a laser light output from the laser diode sub-assembly;

d. automatically comparing the detected characteristics to stored expected characteristics for a properly functioning laser diode sub-assembly;

e. automatically providing control instructions to adjust the position of the lens assembly relative to the laser diode sub-assembly based on the comparison;

f. automatically repeating c-e until the lens assembly is adjusted into an optimal position; and

g. automatically determining test results by analyzing the detected desired characteristics while the lens assembly is in the optimal position.

25. The method according to Claim 24 further comprising automatically re-directing the laser light to detect different desired characteristics of the laser light.

26. The method according to Claim 25 further comprising automatically comparing the different detected characteristics to stored expected characteristics for a properly functioning laser diode sub-assembly, automatically providing control instructions to adjust the position of the lens assembly relative the laser diode sub-assembly based on the comparison, repeating these steps until the lens assembly is adjusted into an optimal

position, and determining test results by analyzing the different detected desired characteristics while the lens assembly is in the optimal position.

27. An apparatus for securing, locating, electrically and thermally contacting a device under test comprising:

a. a block of thermally conductive material;

b. a channel extending vertically through the block and extending horizontally from a front surface of the block towards a back surface of the block without reaching the back surface; and

c. a positioning hole extending vertically through the block and intersecting the channel, wherein the positioning hole includes a top portion with a width larger than a width of a bottom portion of the positioning hole, further wherein the top portion is sufficiently long as to position the device under test within the positioning hole such that a bottom surface of the device under test rests at a top of the bottom portion of the positioning hole and a top surface of the device under test rests above a top surface of the block,

wherein the channel is widened from a standard configuration to an extended configuration by applying a prying means to the channel, and the channel returns to the standard configuration from the extended configuration upon removing the prying means from the channel.

28. The apparatus according to Claim 27 wherein the block is made of beryllium copper.

29. The apparatus according to Claim 28 wherein the channel includes a wedge-shaped opening at the front surface of the block.

30. The apparatus according to Claim 29 wherein a cross-section of the top portion of the positioning hole matches a cross-section of the device under test.

31. The apparatus according to Claim 30 wherein the prying means is a wedge and the channel is widened to the extended configuration by pressing the wedge into the wedge-shaped opening of the channel.

32. The apparatus according to Claim 31 wherein the width of the top portion of the positioning hole is larger than a width of the channel and equal to a width of the device under test.

33. The apparatus according to Claim 32 wherein the cross-section of the top portion of the positioning hole and the device under test is circular.

34. An apparatus for securing a device under test comprising:

a. a beryllium copper block;

b. a channel horizontally bisecting the block such that the channel extends vertically from a top surface of the block through a bottom surface of the block, and the channel extends horizontally from a front surface of the block past a center of the block but not as far as a back surface of the block, wherein the channel includes a wedge-shaped opening at the front surface of the block; and

c. a positioning hole extending from a top center of the top surface of the block to a bottom center of the bottom surface of the block and intersecting the channel, wherein a cross-section of the positioning hole matches a cross-section of the device under test, further wherein the positioning hole includes a top portion with a width larger than a width of the channel and equal to a width of the device under test, and a bottom portion with a width less than the width of the device under

test, further wherein the top portion is sufficiently long as to position the device under test within the positioning hole such that a bottom surface of the device under test rests at a top of the bottom portion of the positioning hole and a top surface of the device under test rests above the top surface of the block,

wherein the width of the channel is widened from a standard width to an extended width by pressing a wedge into the wedge-shaped opening of the channel and the width of the channel returns to the standard width when the wedge is removed from the wedge-shaped opening.

35. The apparatus according to Claim 34 wherein the device under test is a laser diode sub-assembly.

36. The apparatus according to Claim 35 wherein the cross-section of the positioning hole and the laser diode sub-assembly is circular.